19. Proposed by H. C. WHITAKER, B. Sc., M. E., Professor of Mathematics, Manual Training School, Philadelphia, Pennsylvania.

"There was an old woman tossed up in a basket,
Ninety times as high as the moon."
What was her initial velocity, the resistance of the air being neglected?

Solution by ALFRED HUME, C. E., D. Sc., Professor of Mathematics, University of Mississippi, University, Mississippi, and J. C. NAGLE, M.A., C.E., Professor of Civil Engineering, A and M. College, College Station, Texas.

If g is the acceleration of gravity at the earth, R the surface of the earth's mean radius, and x the distance of the body from the center of the earth at the time t, the equation of motion is $\dfrac{d^2x}{dt^2}=-\dfrac{a^2}{x^2}g$.

Integrating, $\left(\dfrac{dx}{dt}\right)^2=\dfrac{2a^2}{x}g+c$.

Taking the moon's distance as $60.3R$, $\dfrac{dx}{dt}=0$ when $x=5427R$.

$$\therefore\quad c=-\frac{2R^2}{5427R}g,\quad \text{and } \left(\frac{dx}{dt}\right)^2=2R^2g\left(\frac{1}{x}-\frac{1}{5427R}\right).$$

When $x=R$, the velocity (the initial velocity required)

$$=\sqrt{2Rg\left(\frac{1}{R}-\frac{1}{5427R}\right)}=\sqrt{\frac{5399}{2713.5}Rg},$$ which is 6.9+ miles per second.

Also solved by *P. S. Berg, E. W. Morrell, H. W. Draughon, G. B. M. Zerr, F. P. Matz*, and the *Proposer*.

NOTE.—Professor Hoover sent a fine solution of problem 18, but it came to late for insertion in April MONTHLY.—EDITOR.

PROBLEMS.

27. Proposed by G. B. M. ZERR, A. M., Principal of High School, Staunton. Virginia.

One thousand balls, each having a mass of 10 grams, and each moving with a velocity of 10 kilometers per second, are confined in a certain space with elastic walls. Into the same space are now introduced one thousand balls each of 100 grams mass, and moving with a velocity each of 10 kilometers per second; collisions take place, and finally, after a number of encounters, the average kinetic energy of each of the two thousand balls is the same. Show that this is 2.75(10)11 in the centimeter-gram-system.

28. Proposed by O. W. ANTHONY, Mexico, Missouri.

A movable finite wire carrying a current os electricity is perpendicular to and on one side of an infinite wire also carrying a current. Invertigate the motion of the movable wire.